WELSH JOINT EDUCATION COMMITTEE
General Certificate of Education
Advanced Subsidiary/Advanced

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311/01

BIOLOGY

MODULE BI1

A.M. THURSDAY, 9 January 2003

(1 hour 30 minutes)

For Examiner's Use Only

Total Marks	

Centre Number .....

Candidate's Name (in full) .....

Candidate's Examination Number .....

INSTRUCTIONS TO CANDIDATES

Write your centre number, name and candidate number in the spaces provided above.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the necessity for good English and orderly presentation in your answers**.**

The quality of written communication will affect the awarding of marks.

No certificate will be awarded to a candidate detected in any unfair practice during the examination.

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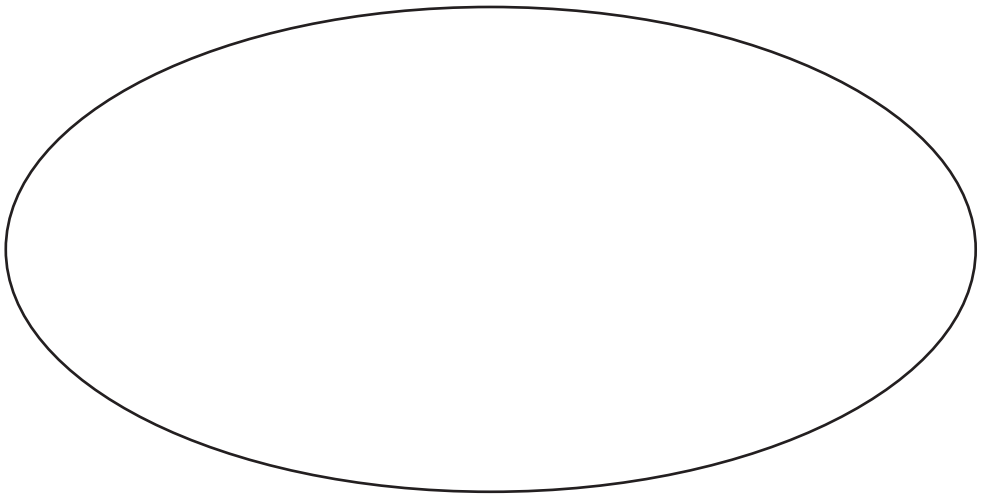
1. Complete the table below by placing ticks in the appropriate column(s). Each row may have one or more ticks.

	Monosaccharide	*Disaccharide*	*Structural Polysaccharide*	*Storage Polysaccharide*
Glucose is an example of				
Cellulose is an example of				
Amylose is an example of				
Maltose is an example of				
Insoluble				
Deoxyribose is an example of				
Glycogen is an example of				

(Total 7 marks)

2. Using the outline below, complete a diagram of a chloroplast. Clearly label all structures drawn. [5]



(Total 5 marks)

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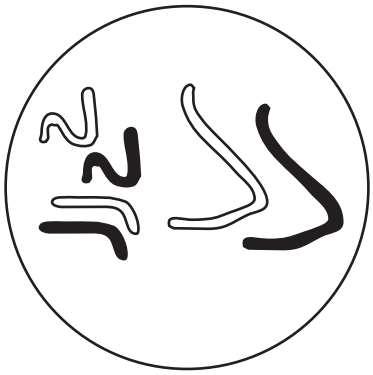
3. The drawing below shows pairs of chromosomes inside a nucleus, which is about to divide by meiosis.



(a) How many chromosomes will there be in each daughter cell after the above cell completes dividing by meiosis? [1]

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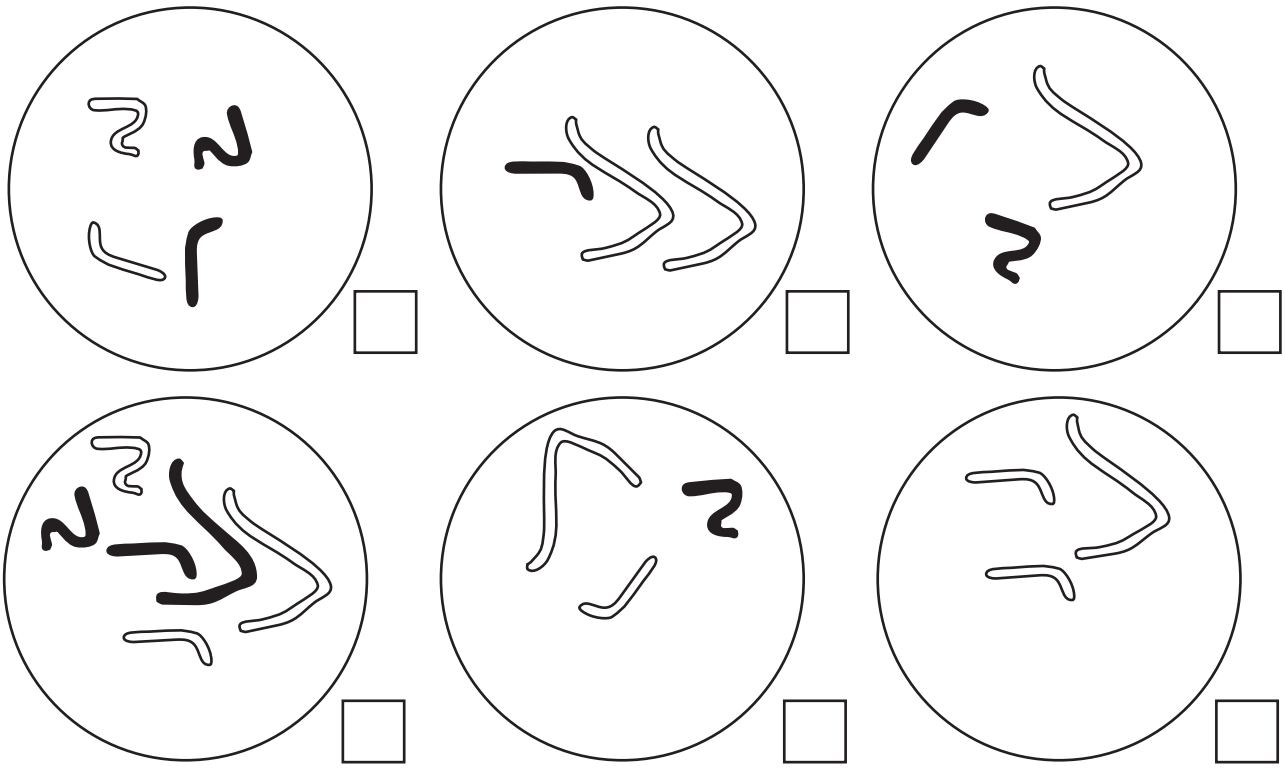
(b) (i) Indicate with a tick (✓) in the box(es) which of the drawings below could be the nuclei of the daughter cells after meiosis. [2]



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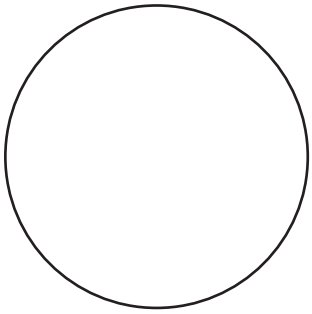
(ii) In the space below draw another nucleus that could result from this meiotic division. [1]



(iii) What is the biological significance of this type of division? [2]

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(c) (i) Complete the table below to show three differences that would be observed when comparing the stages (phases) of **meiosis 1** and mitosis. [3]

Meiosis I	*Mitosis*
1	1
2	2
3	3

(ii) In which phase of the cell cycle does DNA replication occur? [1]

.....

(Total 10 marks)

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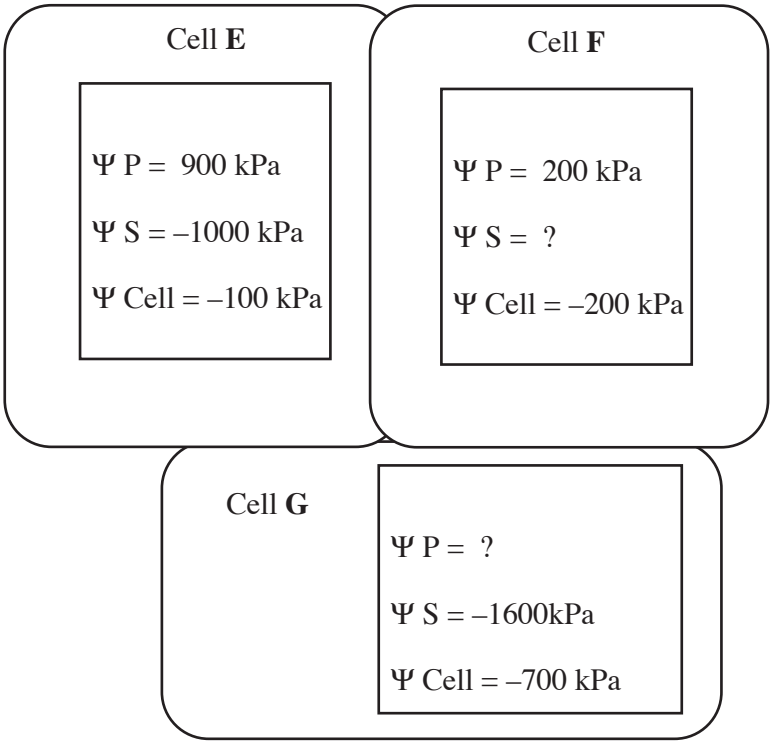
4. *(a)* What is the water potential of pure water? [1]

..... kPa

(b) The diagrams below show the water potentials of 3 cells, which are in contact with each other.



Using the equation

$$\Psi \text{ Cell} = \Psi \text{ P} + \Psi \text{ S}$$

answer the following questions. [2]

(i) Calculate the solute potential of cell **F** ..... kPa

(ii) Calculate the pressure potential of cell **G** ..... kPa

(c) (i) Which cell will gain the most water from the other cells? [1]

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(ii) Which cell will lose most water? [1]

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(d) What word is used to describe the process by which a cell loses water until its plasma membrane draws away from its cell wall? [1]

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(e) What would happen to an **animal** cell placed in an hypotonic solution? [1]

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(Total 7 marks)

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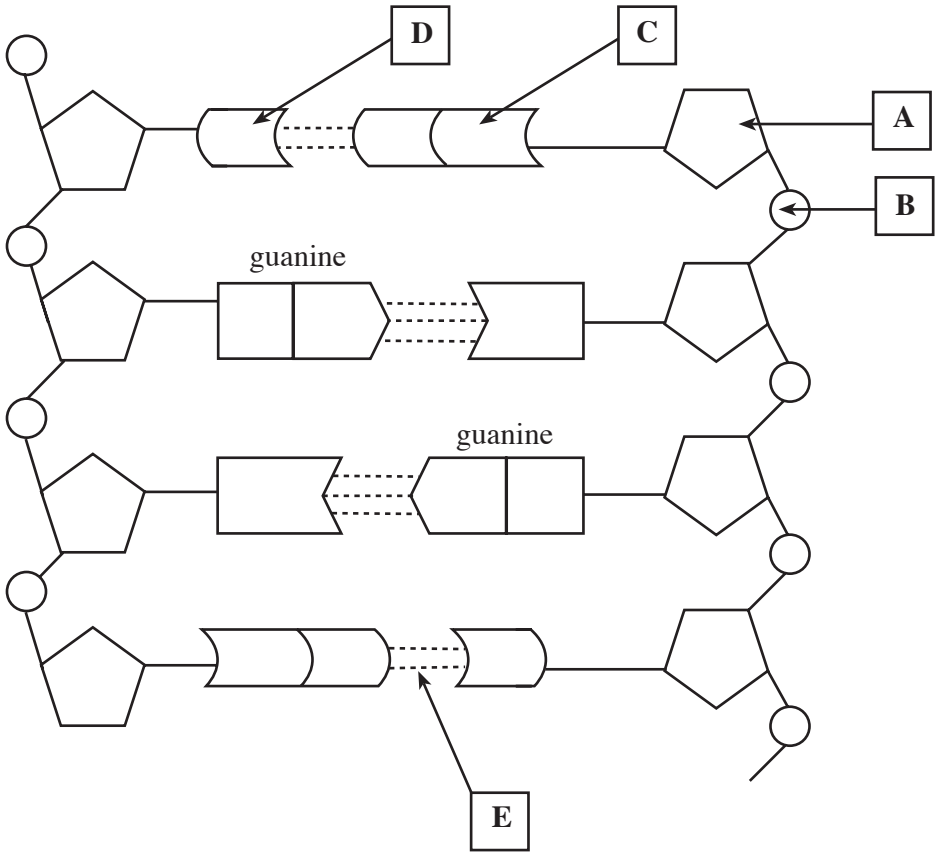
5. The diagram below shows a section of a DNA molecule.



(a) Name the parts labelled **A** and **B**. [2]

A .....

B .....

(b) What type of bonding is shown at **E**? [1]

.....

(c) (i) What type of nitrogenous base is guanine? [1]

.....

(ii) Name the bases **C** and **D.** [2]

C .....

D .....

(d) **On the diagram above,** draw a ring around a single nucleotide unit. [1]

(e) A large sample of DNA was analysed and found to contain 28% of the nitrogenous base guanine. Calculate the percentage of the molecule that would be thymine.
You must show your working. [3]

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(Total 10 marks)

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6. The table below shows the results obtained when the activity of the enzyme salivary amylase was studied at a range of pH. The rate of reaction of the enzyme has been recorded as a proportion of its maximum activity.

	Rate of reaction (proportion maximum activity)								
	pH1	*pH3*	*pH4*	*pH5*	*pH7*	*pH8*	*pH9*	*pH11*	*pH13*
Salivary amylase	0%	0%	2%	12%	100%	40%	8%	1%	0%

(a) Construct a graph of this data on the grid provided.
Join the plots with a smooth curve. [5]

(b) (i) The stomach contents are at pH 2. Use your graph to determine the activity of salivary amylase in the stomach. [1]

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(ii) On your graph draw a curve to indicate the probable pattern of activity of the stomach enzyme pepsin. [2]

(c) Explain how a change in pH can affect the activity of an enzyme. [3]

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(d) During the investigation described above, state **two** factors which must have been kept constant. [2]

1 .....

2 .....

(e) What would have been used to control the pH of the enzyme solutions? [1]

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(Total 14 marks)

7. Some recent developments in Biology are very controversial and many people speak passionately for and against the developments. The following are extracts taken from press articles. Read them carefully and answer the questions that follow.

Extract 1

"Today we are learning the language in which God created life . . . humankind is on the verge of gaining immense new power to heal. Genome science will have a real impact on all our lives, and even more on the lives of our children. It will revolutionize the diagnosis, prevention, and treatment of most, if not all, human diseases." With these words President Clinton announced the completion of the mapping of the human genome on 26/6/2000.

Extract 2

Gene therapy has cured a Welsh baby of the fatal "bubble boy" disease. "His progress seems nothing short of a miracle," says his mother. The treatment, carried out at London's Great Ormond Street Hospital, is one of only a handful of successful gene therapy trials in people.

April 02, New Scientist .com

(a) (i) What name was given to the work announced by President Clinton? (Extract 1) [1]

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(ii) A possible abuse of this work is Eugenics. What do you understand by the term *Eugenics*? [2]

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(b) (i) What is *Gene therapy*? (Extract 2) [1]

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(ii) Explain the function of *liposomes* in gene therapy. [1]

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(iii) Give **one** possible disadvantage of using gene therapy. [1]

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(Total 6 marks)

8. Answer **one** of the following questions.

Either, *(a)* Describe, with the aid of diagrams, the function of the various **nucleic acids** in protein synthesis.

Or *(b)* Describe the various ways in which materials can enter a cell across the plasma membrane. [11]

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(Total 11 marks.)